Bailey

SECTION
E21-17

PRODUCT INSTRUCTIONS

PROCESS COMPUTER TRANSMITTER
TYPE BY

BAILEY METER COMPANY • WICKLIFFE, OHIO 44092

FORM IE21-17-168

Bailey

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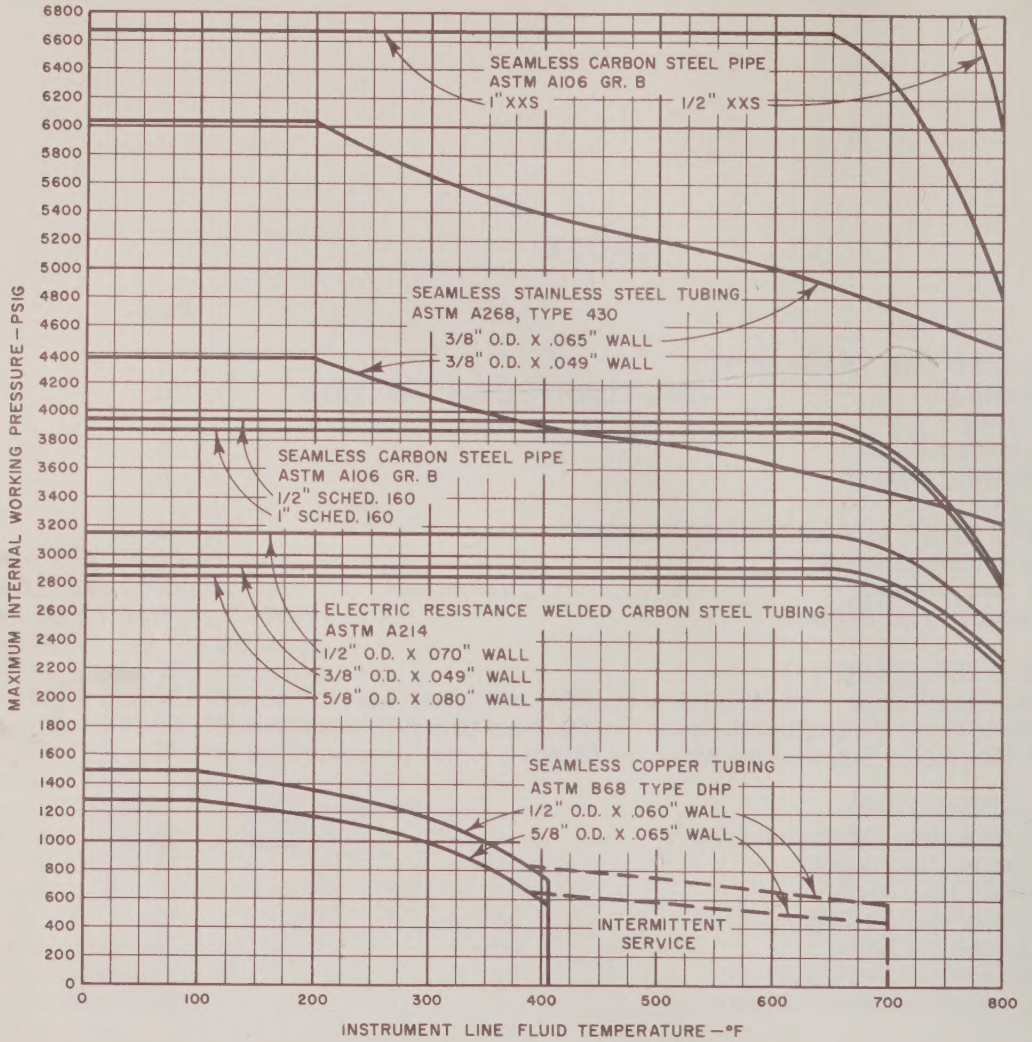


NOTES

1. The curve representing the rating of the tubing selected must lie above the intersection of lines representing the actual expected maximum sustained temperature and pressure.

2. Tubing materials, dimensions, and specifications are those of tubing stocked by Bailey Meter Company. In some cases, larger sizes are recommended. Several commercial pipe-sizes have been shown for convenience.

3. If other materials or sizes of wall thicknesses are used, allowable working pressures must be calculated as provided for in the code.

4. Temperatures are instrument line fluid temperatures. In steam service, tubing preceding blowdown valves shall be suitable for saturated steam temperature at the design main line pressure.

5. Copper tubing may be used in dead end steam or water service up to design pressures and temperatures shown by the dotted curves provided that the temperature within the lines for continuous service does not exceed 406F.

6. Pressure and/or temperature may exceed the normal design conditions occasionally provided the pressure does not exceed the allowable value for the temperature involved by more than:

(1) 15% during 10% of the operating period.
(2) 20% during 1% of the operating period.

7. The recommended minimum wall thickness for socket welded tubing is .065".

8. Tubing wall thicknesses are not calculated to provide additional thickness that may be required for mechanical strength. Tubing should be continuously supported in conduit, trays or channels.

FIGURE 1 - Selection Chart for Instrument Piping, Based on Code for Pressure Piping, USAS B31.1.0

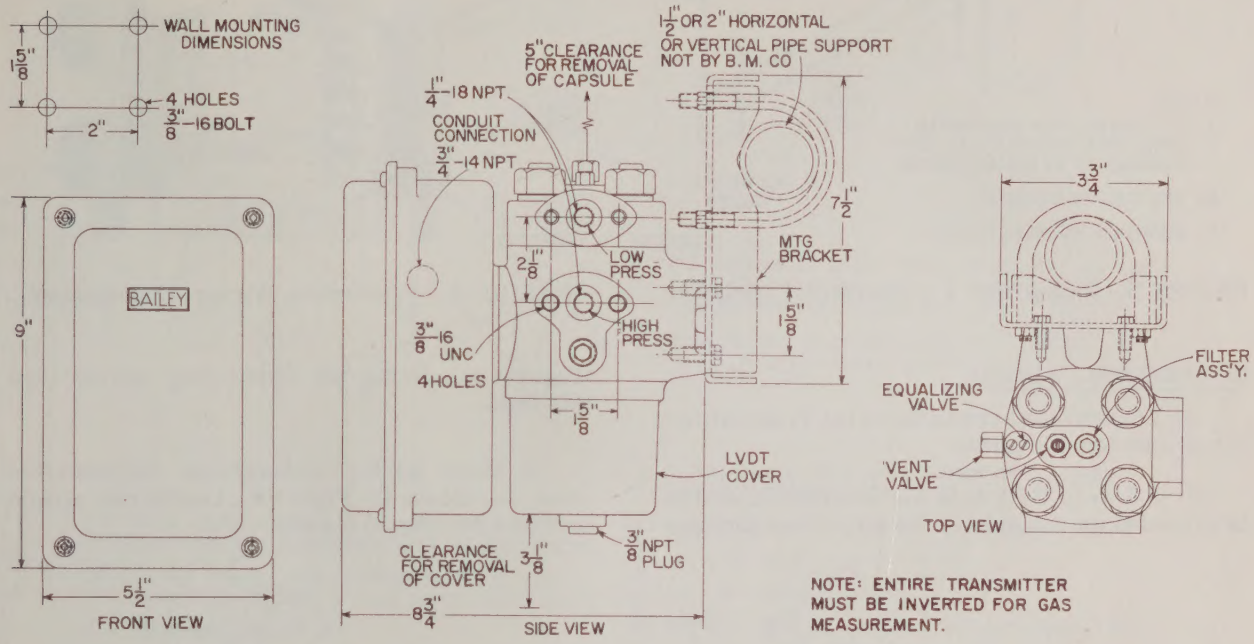


FIGURE 2 - Mounting Dimensions for Type BY Transmitter

INSTALLING THE TRANSMITTER

UNPACKING

1. Check for any obvious damage to carton or contents (see inside back cover).

2. Remove all loose packing from carton.

3. Carefully remove Transmitter from carton.

MOUNTING

NOTE: If a preservice adjustment check is desired, perform "Pre-Service Adjustment Check" on page 17, before mounting Transmitter.

1. Transmitter may be wall or pipe mounted as shown in Figure 2. NOTE: Entire Transmitter is inverted when measuring gases.

2. Wall Mounting - mount Transmitter in vertical position using four 3/8-16 bolts.

3. Pipe Mounting - mount Transmitter in vertical position using bracket (Pt. No. 682603-1) and U-bolt (Pt. No. 682337-1). Bracket is suitable for mounting Transmitter on 1-1/2 or 2" pipe. NOTE: Avoid mounting unit on process pipes which may cause excessive vibration or temperature effect.

4. Make certain internal equalizing valve (Figure 2) is open (full counterclockwise).

CONNECTING PIPING

1. Connecting piping should be in accordance with USAS Code For Pressure Piping (see Figure 1). Transmitter connections are 1/4-18 NPT female, 2-1/8" on centers. (Allows use of commercially available manifolds as shown in Figure 3.)

2. Liquid Measurement - make piping connections in accordance with Figures 5 - 8, as applicable.

3. Gas Measurement - make piping connections as shown in Figure 10.

4. Make certain all external valves in piping are closed before placing Transmitter in service.

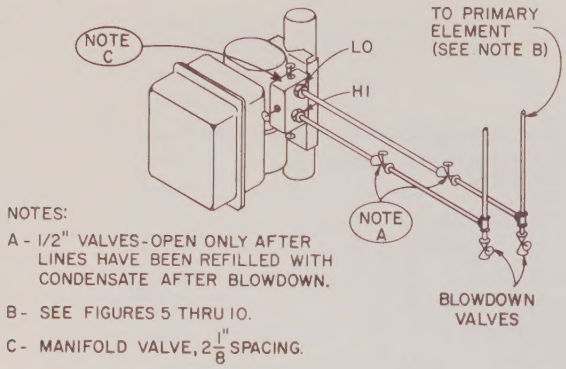

NOTE C
LO
HI
TO PRIMARY ELEMENT (SEE NOTE B)
NOTE A
BLOWDOWN VALVES
NOTES:
A - 1/2" VALVES - OPEN ONLY AFTER LINES HAVE BEEN REFILLED WITH CONDENSATE AFTER BLOWDOWN.
B - SEE FIGURES 5 THRU 10.
C - MANIFOLD VALVE, 2 1/8" SPACING.

FIGURE 3 - Piping with a Commercial Manifold

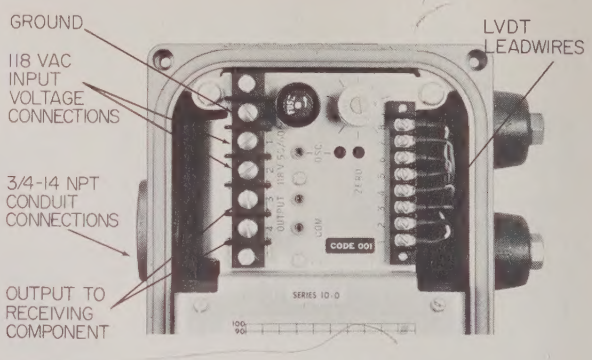


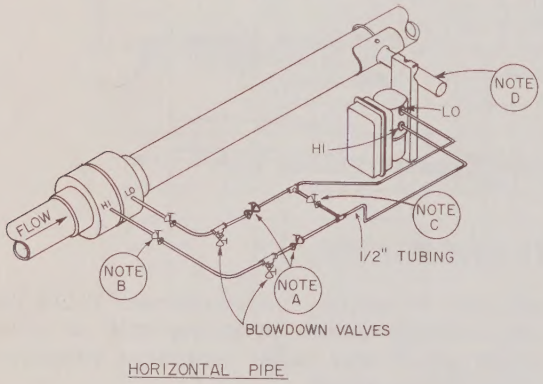
FIGURE 4 - Connecting Wiring Arrangement

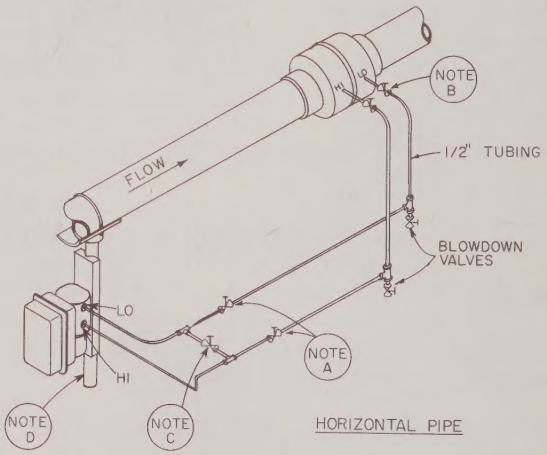
CONNECTING WIRING

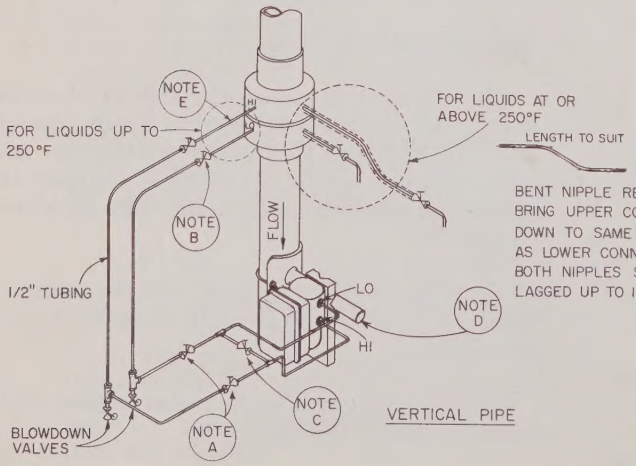
1. Loosen four screws securing Transmitter cover and remove cover.

2. A 3/4-14 NPT hole for conduit connection is provided on the side of the amplifier package (Figure 4). Bring all connecting wiring thru this hole.

3. Make wiring connections to terminal block as shown in Figure 4. Leadwires should be No. 12 or No. 14 AWG.







NOTES:

GENERAL:

MOUNT TRANSMITTER BELOW PRIMARY ELEMENT CONNECTIONS.

ALL HORIZONTAL LINES SHOULD SLOPE AT LEAST ONE INCH PER FOOT DOWNWARD TO TRANSMITTER.

TRANSMITTER MUST BE THOROUGHLY VENTED TO AVOID ERRORS IN MEASUREMENT.

ALL VALVES AT PRESSURE CONNECTIONS SHOULD BE IN NEARLY VERTICAL POSITION.

(A) 1/2" VALVES - STEMS UP OR AT SLIGHT ANGLE - STAGGER FOR CLEARANCE.

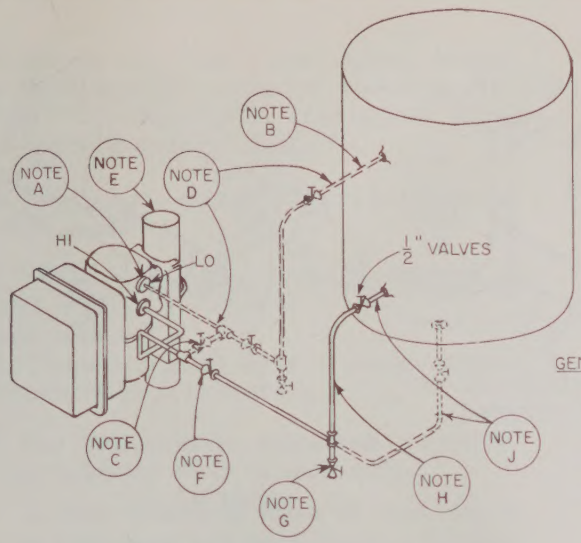
(B) OPTIONAL SHUTOFF VALVES FOR LONG CONNECTING LINES OR WHEN DESIRABLE TO MOUNT UNIT AT FLOOR LEVEL TO PERMIT SERVICING.

(C) EQUALIZING VALVE.

(D) 1 1/2" 2" SUPPORTING PIPE (NOT BY B.M.CO.)

(E) 3/4" NIPPLES TO SIDE OF FLANGE (LAGGING AS APPLICABLE)

FIGURE 5 - Connecting Piping for Clean Liquid



GENERAL

ALL HORIZONTAL LINES SHOULD SLOPE AT LEAST ONE INCH PER FOOT DOWNWARD TO TRANSMITTER (NOTE EXCEPTION IN (D)).

TRANSMITTER MUST BE THOROUGHLY VENTED TO AVOID MEASUREMENT ERRORS.

NOTES

(A) OPEN VESSEL LEVEL - AT ATMOSPHERIC PRESSURE LOW PRESSURE CONNECTION OPEN TO ATMOSPHERE.

(B) CLOSED VESSEL LEVEL - PRESSURIZED. INCLUDE CONNECTION TO TOP OF TANK ABOVE LIQUID LEVEL.

(C) EQUALIZING VALVE.

(D) IF THIS LINE IS USED, SLOPE DOWNWARD TO VESSEL AND TO BLOWDOWN VALVE.

(E) 1 1/2" - 2" SUPPORT PIPE (NOT BY B.M.CO.)

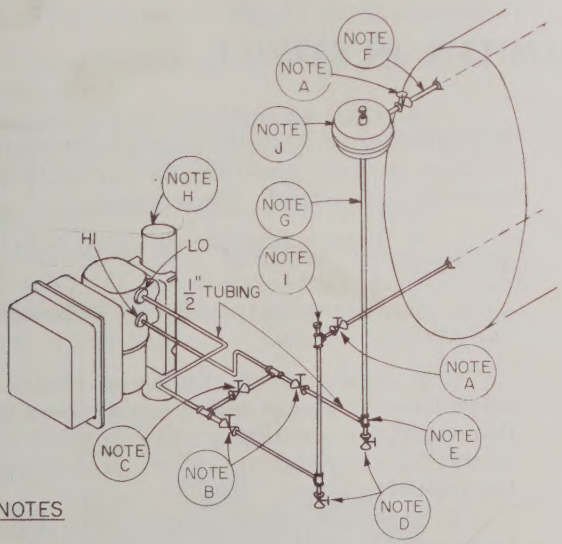
(F) 1/4" - 1/2" VALVE

(G) 1/2" BLOWDOWN VALVE

(H) 1/2" PIPE OR 5/8" OD. TUBING (TO BLOWDOWN VALVE)

(J) CONNECTION IN SIDE OR BOTTOM OF TANK

FIGURE 6 - Connecting Piping for Open or Closed Tank, Noncondensing Atmosphere



GENERAL

ALL HORIZONTAL LINES SHOULD SLOPE AT LEAST ONE INCH PER FOOT DOWNWARD TO TRANSMITTER.

TRANSMITTER MUST BE THOROUGHLY VENTED TO AVOID MEASUREMENT ERRORS.

REVERSE SIGNAL LEADS TO OBTAIN AN INCREASING OUTPUT (-10V TO +10V) FOR INCREASING LEVEL.

NOTES

(A) 1" VALVE

(B) 1/4" VALVE

(C) EQUALIZING VALVE

(D) 1/2" BLOWDOWN VALVES

(E) 1/2" TEES

(F) 1" NIPPLES (TOP & BOTTOM)

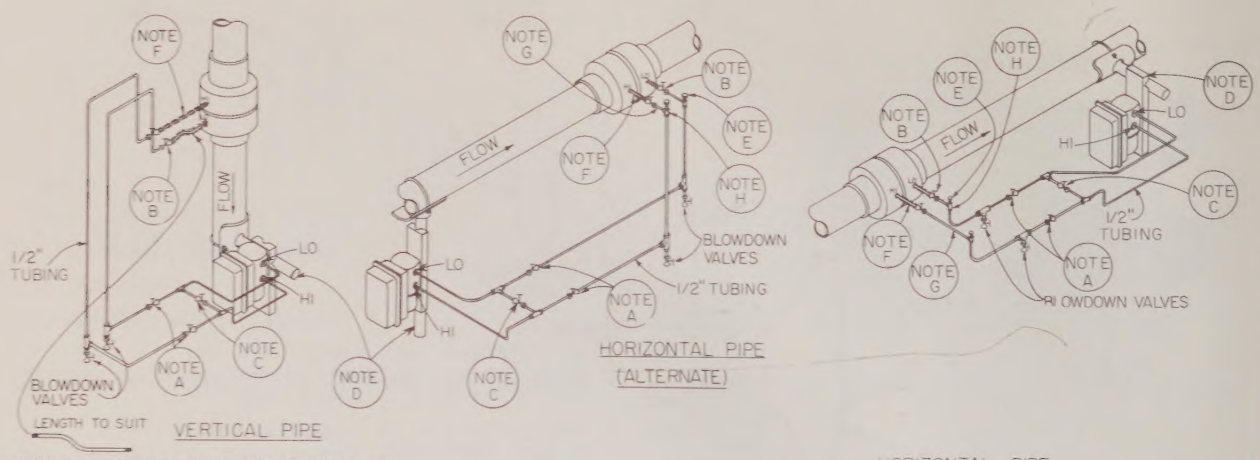
(G) 1/2" PIPE OR 5/8" OD TUBING (TO BLOWDOWN VALVES)

(H) 1-1/2" - 2" SUPPORT PIPE (NOT BY B.M.CO.)

(I) PLUG OR VENT VALVE FOR FILLING AND VENTING.

(J) RESERVOIR

FIGURE 7 - Connecting Piping for Closed Tank, Condensing Atmosphere



LOWER IMPULSE LINE MUST BE BROUGHT UP TO ELEVATION OF UPPER IMPULSE LINE. LAG FROM MAIN LINE TO SHUT OFF VALVES.

NOTES

(A) 1/2" VALVES - STEMS UP OR AT SLIGHT ANGLE - STAGGER FOR CLEARANCE.

(B) OPTIONAL SHUTOFF VALVES FOR LONG CONNECTING LINES OR WHEN DESIRABLE TO MOUNT UNIT AT FLOOR LEVEL TO PERMIT SERVICING.

(C) EQUALIZING VALVE.

(D) 1-1/2" – 2" SUPPORTING PIPE (NOT BY B.M.CO.)

(E) PLUGS OR VENT VALVES.

(F) 1/2" NIPPLES TO SIDES OF FLANGE - LAG TO VALVES.

(G) 1/2" NIPPLES - AT LEAST 4" LONG.

(H) 1/2" TEES - BOTH AT SAME ELEVATION.

FIGURE 8 - Connecting Piping for Steam Measurement

PLACING THE TRANSMITTER IN SERVICE

LIQUID MEASUREMENT
(Refer to Figures 5 thru 9)

1. Turn on power supply to Transmitter.

2. Open equalizing valve in pressure line to Transmitter.

3. Close shutoff valve in HI and LO pressure lines to Transmitter. (Valves will be closed if placing in service for first time.)

4. If blowdown valves are installed:

a. Open one blowdown valve slowly. Allow to blow a sufficient length of time to clear line (usually not more than 15 seconds is required). Close valve.

b. Repeat step 4a with other blowdown valve.

5. If blowdown valves are not installed:

a. Disconnect connecting piping at Transmitter HI and LO connections.

b. Open shutoff valve in HI pressure line to Transmitter. Allow to blow a sufficient length of time to clear line (usually not more than 15 seconds is required). Close valve.

c. Repeat Step 5b with valve in LO pressure line.

d. Reconnect piping at Transmitter HI and LO connections.

6. If Transmitter measures steam flow, allow time for steam in connecting lines to condense and for connecting lines to reach normal operating temperature before proceeding with the following steps.

7. With external equalizing valve still open, back out Transmitter internal equalizing valve V3 until it hits its travel stop. (NOTE: Valve V3 may already be open due to factory shipping procedure.)

8. Slowly open shutoff valve in HI pressure line and allow pressure to build up on both sides of measuring capsule.

9. "Crack" vent valves V1 and V2 (open slowly, less than 1/4 turn to unseat) until all

air is forced out, then close valves. Output signal (at Receiving Component) should be -10v DC. NOTE: If voltage is not correct see "Calibrating the Transmitter", page 17.

10. Slowly open shutoff valve in LO pressure line to Transmitter.

11. Close Transmitter internal equalizing valve V3.

12. Close equalizing valve in pressure line. The Transmitter is in service.

13. For Transmitters connected to vertical pipe, the following check is necessary.

a. With equalizing valve V3 open, check voltage across output test jacks J1 and J2 for possible zero shift (use voltmeter accurate to ±.10%).

b. Refer to Figure 13 on page 14. Remove 5/16 Allen pipe plug (55) on bottom of Transmitter. Adjust coil advance screw (48) until output voltage is -10 volts DC (±.05v) if necessary.

GAS MEASUREMENT (Refer to Figures 10 and 11)

NOTE: Transmitter must be installed upside-down for gas measurement.

1. Turn on power supply to Transmitter.

2. Open equalizing valve in pressure line to Transmitter.

3. Close shutoff valves in HI and LO pressure lines to Transmitter.

4. If blowdown valves are installed:

a. Open one blowdown valve slowly. Allow to blow a sufficient length of time to clear line (usually not more than 15 seconds is required). Close valve.

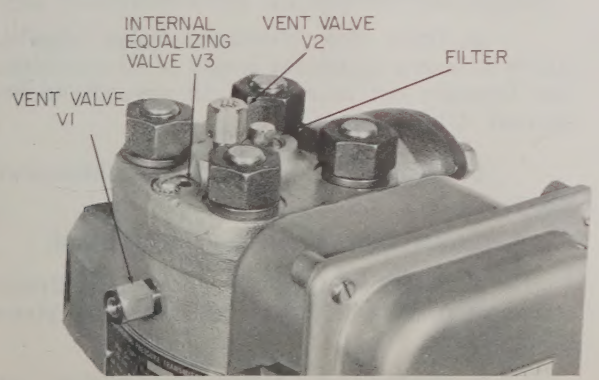


FIGURE 9 - Location of Vent Valves

b. Repeat Step 4a with other blowdown valve.

5. If blowdown valves are not installed:

a. Disconnect connecting piping at Transmitter HI and LO connections.

b. Open shutoff valve in HI pressure line to Transmitter. Allow to blow a sufficient length of time to clear line (usually not more than 15 seconds is required). Close valve.

c. Repeat Step 5b with valve in LO pressure line.

d. Reconnect piping at Transmitter HI and LO connections.

6. With external equalizing valve still open, back out Transmitter internal equalizing valve V3 until it hits its travel stop. (NOTE: Valve V3 may already be open due to factory shipping procedure.)

7. Slowly open shutoff valve in HI pressure line and allow pressure to build up on both sides of measuring capsule. Output signal (at Receiving Component) should be -10v DC. NOTE: If voltage is not correct see "Calibrating the Transmitter", page 17.

8. Slowly open shutoff valve in LO pressure line to Transmitter.

9. Close Transmitter internal equalizing valve V3.

10. Close equalizing valve in pressure line. The Transmitter is in service.

REMOVING FROM SERVICE

Liquid or Gas Measurement
(Refer to Figure 9)

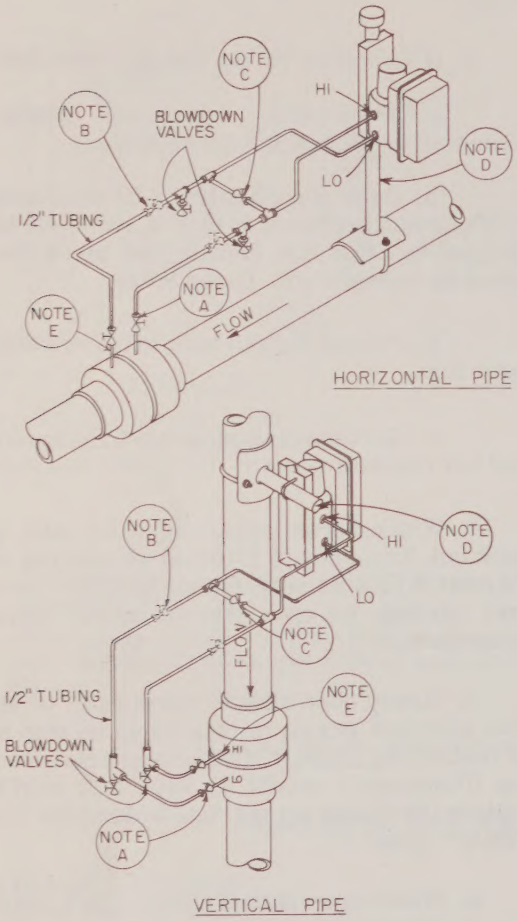
1. Open Transmitter internal equalizing valve V3 until it hits its travel stop.

2. Open equalizing valve in pressure line to Transmitter.

3. Close shutoff valves in HI and LO pressure lines.

4. "Crack" vent valves V1 and V2. (Open blowdown valves, if installed.)

5. Disconnect 118v power to Transmitter. The Transmitter is now out of service.



NOTES:

GENERAL:

TRANSMITTER INVERTED FOR GAS MEASUREMENT

MOUNT TRANSMITTER ABOVE PRIMARY ELEMENT CONNECTIONS.

MAKE PRIMARY ELEMENT CONNECTIONS ON TOP OF FLANGE IN HORIZONTAL FLOW

ALL HORIZONTAL CONNECTING LINES SHOULD SLOPE AT LEAST ONE INCH PER FOOT DOWNWARD TO MAIN LINE.

(A) 1/2" VALVES - STEMS UP OR AT SLIGHT ANGLE - STAGGER FOR CLEARANCE

(B) OPTIONAL SET OF VALVES FOR LONG CONNECTING LINES OR WHEN DESIRABLE TO MOUNT UNIT AT FLOOR LEVEL TO PERMIT SERVICING.

(C) EQUALIZING VALVE.

(D) $1\frac{1}{2}$" - 2" SUPPORTING PIPE (NOT BY B.M. CO.)

(E) $\frac{1}{2}$" NIPPLES TO SIDES OF FLANGE

FIGURE 10 - Connecting Piping for Gas Measurement

ROUTINE SERVICING

CONNECTING PIPING

1. Keep all piping connections tight. If gas measurement, check piping for leakage while under pressure with a leak detecting solution.

2. If process fluid is impure, periodically blow down connecting piping as outlined under "Blowing Down Connecting Piping".

BLOWING DOWN CONNECTING PIPING
(Refer to Figures 5 thru 11 as applicable)

1. Open equalizing valve in pressure line to Transmitter.

2. Close shutoff valves in HI and LO pressure lines to Transmitter.

3. If blowdown valves are installed:

a. Open one blowdown valve slowly. Allow to blow a sufficient length of time to clear line (usually not more than 15 seconds is required). Close valve.

b. Repeat step 3a with other blowdown valve.

4. If blowdown valves are not installed:

a. Crack vent valves V1 and V2. Crack unions or fittings below shutoff valves and bleed off pressure.

b. Disconnect connecting piping at Transmitter HI and LO connections.

c. Open shutoff valve in HI pressure line to Transmitter. Allow to blow a sufficient length of time to clear line (usually not more than 15 seconds is required). Close valve.

d. Repeat step 4c with valve in LO pressure line.

e. Reconnect piping at Transmitter HI and LO connections.

5. If Transmitter measures steam flow, allow time for steam in connecting lines to condense and for connecting lines to reach normal operating temperature before proceeding with the following steps.

6. With external equalizing valve still open, back out Transmitter internal equalizing valve V3 until it hits its travel stop. (NOTE: Valve V3 may already be open due to factory shipping procedure.)

7. Slowly open shutoff valve in HI pressure line and allow pressure to build up on both sides of measuring capsule.

8. "Crack" vent valves V1 and V2 (open slowly, less than 1/4 turn to unseat) until all air is forced out, then close valves. Output signal (at Receiving Component) should be -10v DC. NOTE: If voltage is not correct see "Calibrating the Transmitter", page 17.

9. Slowly open shutoff valve in LO pressure line to Transmitter.

10. Close Transmitter internal equalizing valve V3.

11. Close equalizing valve in pressure line. The Transmitter should respond immediately.

GAS MEASURING TRANSMITTER MOISTURE CHECK

Periodically check gas measuring Transmitters for accumulated moisture as follows (refer to Figures 10 and 11).

1. Open equalizing valve in pressure line to Transmitter.

2. Close shutoff valves in HI and LO pressure lines.

3. Open vent valves V1 and V2. Allow moisture to blow out.

4. Loosen filter assembly on bottom of Transmitter housing, and screw out filter.

CAUTION: Do not allow dirt or other impurities to get on filter while it is out of Transmitter housing.

5. Allow moisture to drain out of Transmitter housing. Close Transmitter vent valves V1 and V2 and replace filter assembly.

6. Open shutoff valve in HI pressure line.

7. Open shutoff valve in LO pressure line.

8. Close equalizing valve.

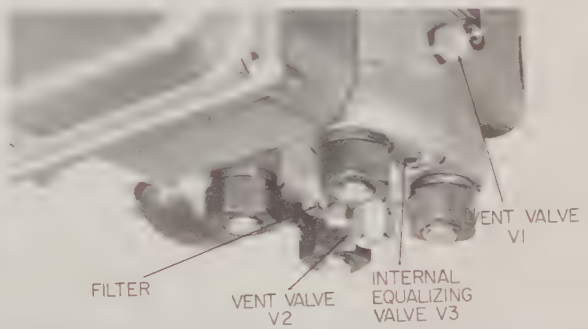


FIGURE 11 - Transmitter for Gas Measurement

TROUBLESHOOTING

1. If Transmitter is inoperative or if operation is faulty, first check Transmitter calibration as outlined under "Pre-Service Adjustment Check" on page 17.

2. If it is suspected that Transmitter is mechanically defective, refer to "Fault Correction Chart".

DISASSEMBLING THE TRANSMITTER

When disassembling the Transmitter for any reason, replace all accessible O-rings or seals as these tend to deteriorate with time.

REPLACING THE FILTERS
(Refer to Figure 12)

1. Remove Transmitter from service.

2. Screw out filter assembly (27) mounted on Transmitter capsule housing cover (17).

3. Screw out filter assembly mounted on Transmitter capsule housing (33).

4. Check filters for thick covering of particles. Wash as necessary. If particles cannot be removed by washing, replace filters as follows:

a. Slip backup rings (26) over filter into groove on new filter assemblies. When backup ring is in groove, slide backup ring towards 5/8-18 thread.

b. Slip O-rings (25) over new filters into groove. NOTE: Proper order of these rings is essential.

5. Screw filter assemblies back in place and tighten.

REPLACING THE SEALS (Refer to Figure 12)

1. Remove Transmitter from service.

2. Remove four nuts (29) and four spring lockwashers (28) from studs (35) on top of Transmitter capsule housing cover (17).

3. Lift off capsule housing cover. Keep cover as straight as possible so center post does not strike capsule.

4. Remove seal bushing (15) in capsule housing cover.

5. Remove old seal (16) and install new seal in capsule housing cover.

6. Remove wavy washer (43) and capsule assembly (40). Do not bend core rod assembly (38) as capsule is being extracted. CAUTION: To avoid damage to capsule, use extreme care when handling. Do not get impurities on capsule.

7. Remove seal bushing (37) in capsule housing (33). Remove old seal (36) and install new seal in capsule housing.

8. Reverse above procedures to reassemble. Torque seal bushings to 80 in-lb.

9. Calibrate Transmitter as outlined under "Calibrating the Transmitter", page 17.

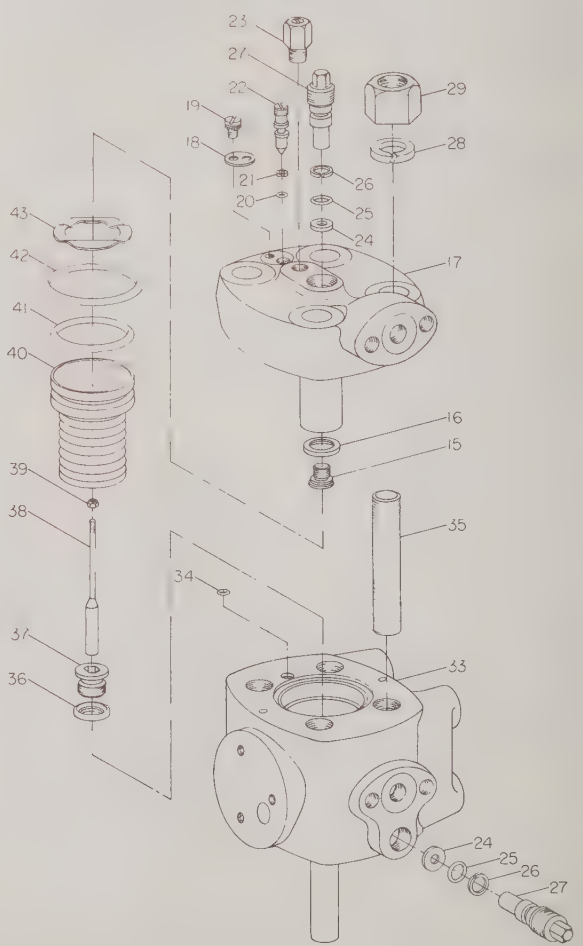


FIGURE 12 - Capsule Housing Assembly

FAULT CORRECTION CHART

FAULT	PROBABLE CAUSE	CORRECTIVE ACTION
1. Output readings are nonlinear.	a. Capsule clogged with impurities.	a. Remove capsule as outlined under "Replacing the Capsule Sensor" page 16. Wash out capsule with water. If problem still occurs, replace capsule.
	b. Overpressure has occurred.	b. Remove and inspect capsule as outlined under "Replacing the Capsule Sensor", page 16. If faulty, replace capsule.
2. Output readings indicate hysteresis.	a. Core rod is bent.	a. Remove core rod assembly from capsule as outlined under "Replacing the Capsule Sensor", page 16. If core rod is bent, straighten in drill press until runout is within .015-inch.
	b. Overpressure has occurred.	b. See 1b above.
3. Transmitter operation is sluggish.	a. Dirty filters.	a. Check filters as outlined under "Replacing the Filters", page 12.
4. Transmitter is inoperative or cannot be calibrated.	a. Blown fuse.	a. Replace fuse.
	b. Mechanical zero adjustment faulty.	b. Remove coil retaining plate and straighten thrust bearing as outlined in steps 6 thru 9 under "Replacing the LVDT", page 14.
	c. Open winding on LVDT.	c. Refer to Figure 14. Disconnect LVDT leadwires from terminal block. Check continuity of LVDT windings with ohmmeter (see Figure 24). If faulty, replace as outlined under "Replacing the Linear Variable Differential Transformer", page 14.
	d. Faulty wiring.	d. Check for correct connection between the LVDT and the amplifier assembly. (See Figure 15).
	e. Amplifier failure.	e. Turn coil advance screw (Item 48 in Figure 13) 7 or 8 turns clockwise, then counterclockwise. If no output appears, or if output voltage does not change, replace amplifier as outlined under "Replacing the Amplifier", page 15.
	f. Capsule failure.	f. Remove and inspect capsule as outlined under "Replacing the Capsule Sensor", page 16. If faulty, replace capsule.

REPLACING THE LINEAR VARIABLE DIFFERENTIAL TRANSFORMER (Refer to Figure 13)

1. Turn off supply voltage to amplifier. Loosen four screws and remove amplifier cover.

2. Disconnect power and output leadwires, and LVDT coil leadwires from terminal blocks (Figure 14).

3. Loosen four screws (6) in amplifier assembly (7) and remove amplifier assembly from amplifier housing (14) (Figure 26).

4. Loosen four screws (44) in LVDT cover assembly and remove cover assembly from capsule housing (33).

5. Loosen two screws (56) and remove coil retaining plate (51) from studs (57).

6. Slip LVDT coil assembly (52) off of core tube projecting from capsule housing. Pull LVDT coil leadwires thru access hole in capsule housing.

7. Slip old spacer (53), spring (54) and new LVDT coil assembly on core tube.

8. Assemble old needle thrust bearing (50) and bearing races (49) into end of new LVDT coil assembly. Make certain that bearing and races are straight and in correct order.

9. Replace coil retaining plate and retighten screws. Coil advance screw (48) should be able to advance LVDT when turned.

10. Route LVDT coil leadwires thru diagonal access hole in capsule housing. Pull wires thru hole in amplifier housing (leave some slack on wires).

11. Replace amplifier assembly in amplifier housing cover. Retighten four screws.

12. Connect LVDT coil leadwires to terminal block in accordance with Figure 15.

13. Replace LVDT cover and retighten four screws.

14. Recalibrate Transmitter in accordance with procedure outlined in "Calibrating the Transmitter", page 17.

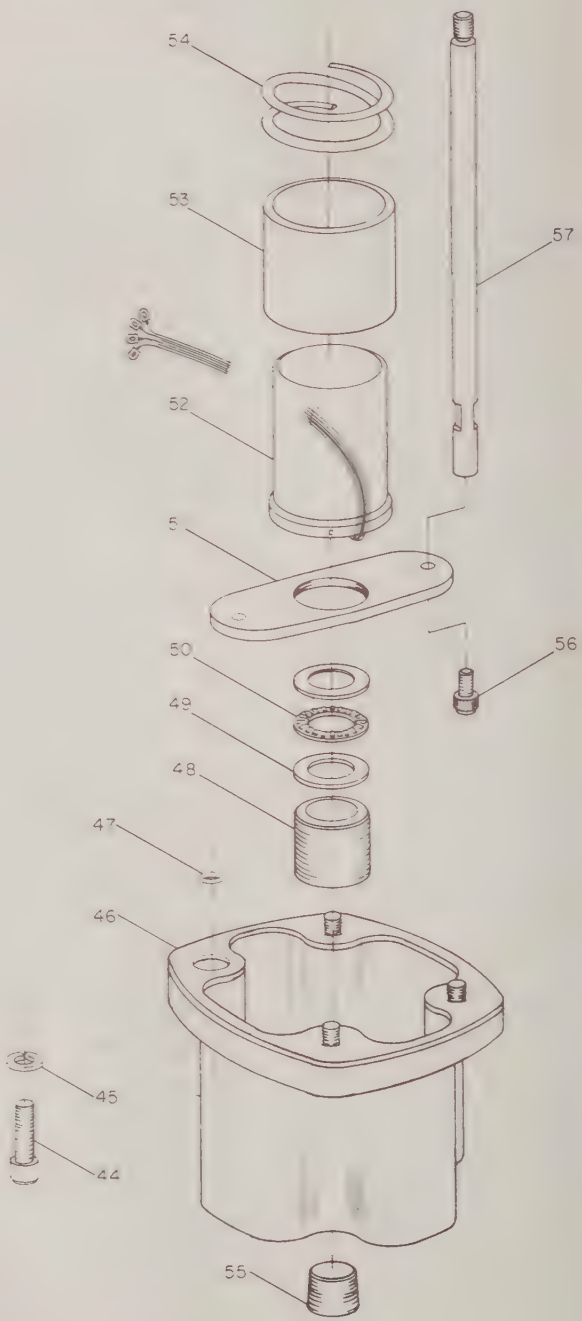


FIGURE 13 - LVDT and Cover Assembly

REPLACING THE AMPLIFIER (Refer to Figure 26 on page 27.)

1. Loosen four screws and remove amplifier cover.

2. Disconnect power and output leadwires, and LVDT coil leadwires from terminal blocks (Figure 14).

3. Loosen four screws (6) in amplifier assembly (7) and remove amplifier assembly from amplifier housing (14).

4. To install new amplifier assembly, reverse steps 1 thru 3 above. Connect LVDT coil leadwires to terminal block in accordance with Figure 15.

5. Recalibrate Transmitter in accordance with procedure outlined in "Calibrating the Transmitter", page 17.

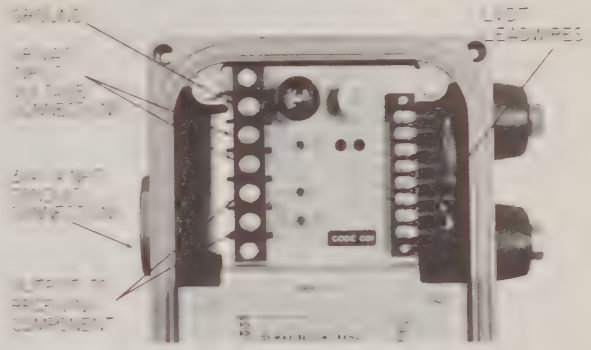


FIGURE 14 - Connecting Wiring Arrangement

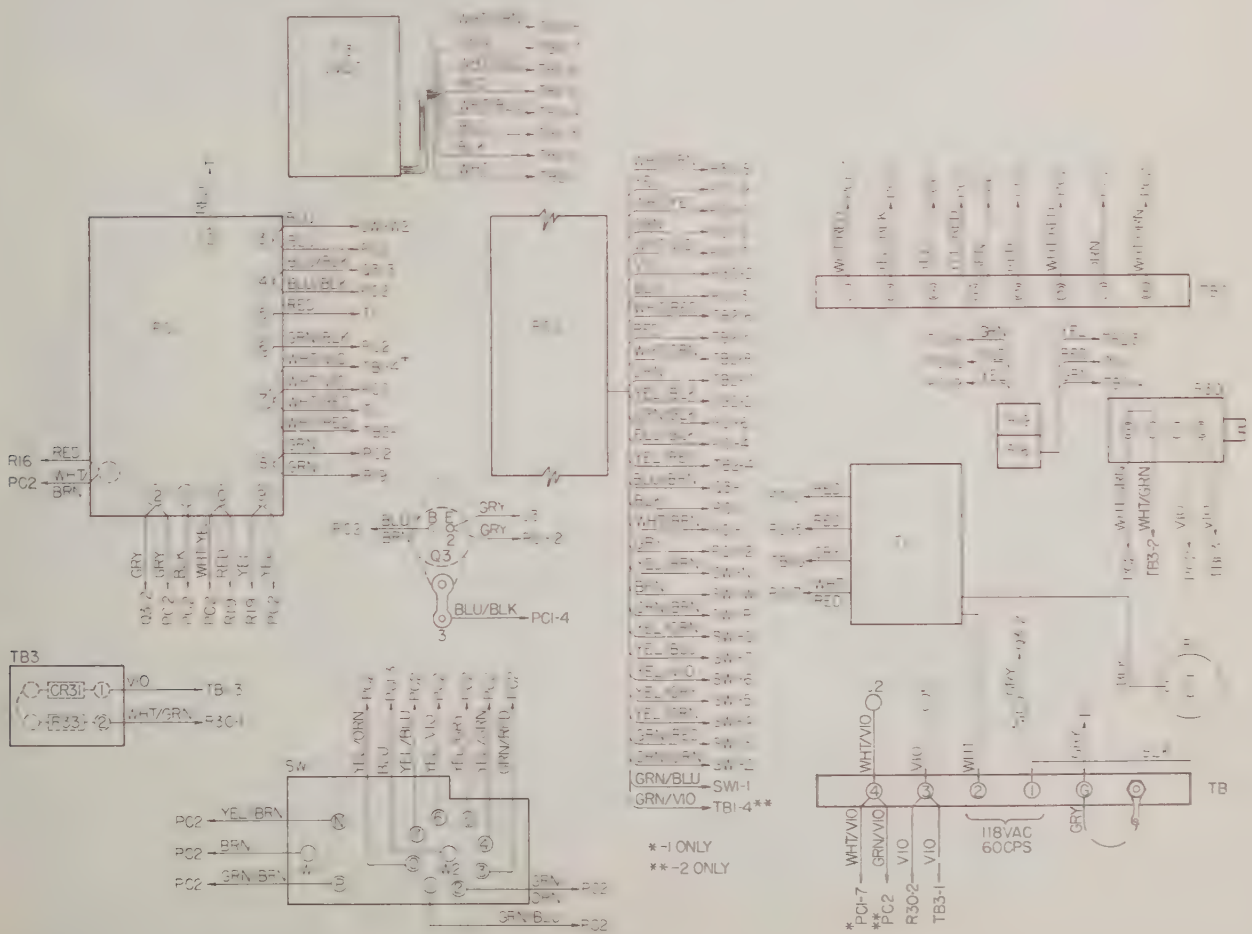


FIGURE 15 - Wiring Diagram for BY Transmitter

REPLACING THE CAPSULE SENSOR (Figure 12)

1. Remove Transmitter from service.

2. Remove four nuts (29) and four spring lockwashers (28) from studs (35) on top of transmitter capsule housing cover (17).

3. Lift off capsule housing cover. Keep cover as straight as possible so center post does not strike capsule.

4. Remove wavy washer (43) from counterbore in capsule assembly (40).

CAUTION: Use extreme care when handling capsule assembly to avoid damage to capsule. Do not allow dirt or other impurities to get on capsule.

5. Remove capsule assembly from capsule housing (33). Cover equalizing valve hole with finger and apply 4 to 5 psi to HI pressure side of Transmitter if necessary to blow capsule out of housing. Do not bend core rod assembly (38) as capsule is being extracted.

6. Loosen nut (39) on core rod assembly and unscrew from capsule assembly.

7. Slip O-ring (41) into groove on new capsule assembly.

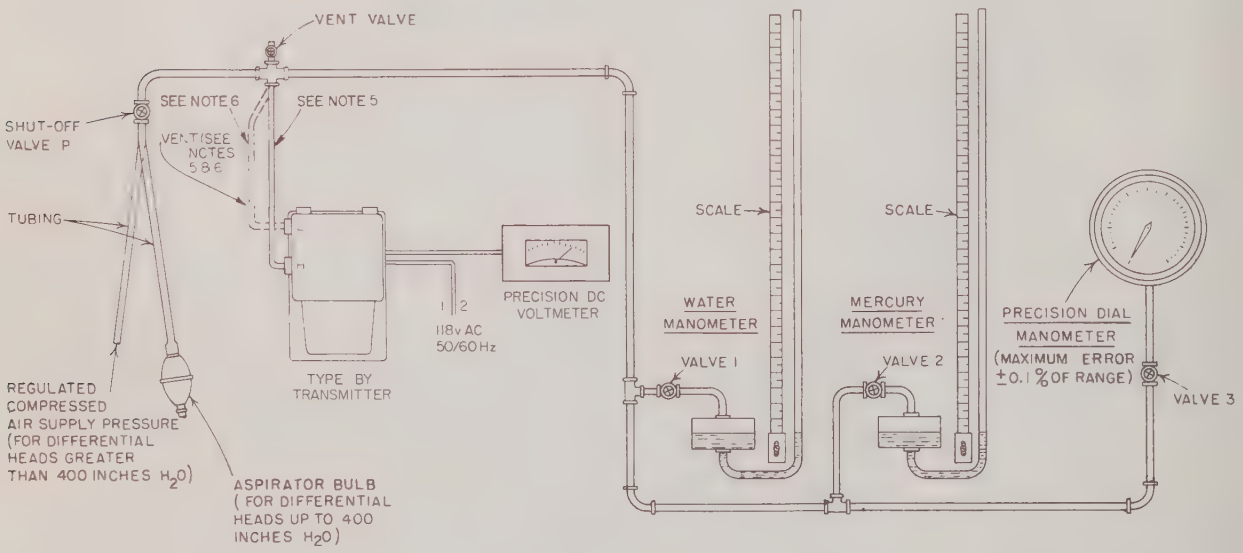
6. Screw core rod assembly into new capsule assembly until rod bottoms in hole and back out 2 turns.

9. Tighten nut on core rod assembly.

10. Make certain capsule assembly is clean (no dirt in convolutions).

11. Reverse the above procedure to reassemble. NOTE: Lubricate studfitting nuts (29) and torque to 90-100 ft-lb.

12. Calibrate Transmitter as outlined under "Calibrating the Transmitter", page 17.



NOTES:
1 - USE ONLY MANOMETER(S) REQUIRED FOR MAXIMUM INSTRUMENT DIFFERENTIAL HEAD READING.
2 - FOR GREATER SENSITIVITY (LOW MAXIMUM DIFFERENTIAL) USE INCLINED WATER MANOMETER
3 - FOR PIPING SPECIFICATIONS SEE INSTRUCTION SECTION GI8-3, INSTRUMENT CONNECTING PIPING.
4 - SEE "CALIBRATION" IN THIS INSTRUCTION SECTION, FOR DETAILED INSTRUCTIONS.
5 - FOR OPEN OR CLOSED TANK, NON-CONDENSING ATMOSPHERE, AND FLOW, MAKE CONNECTION TO "H" AND VENT "L".
6 - FOR CLOSED TANK CONDENSING ATMOSPHERE, MAKE LEVEL CONNECTION TO "L" AND STATIC HEAD CONNECTION TO "H"

FIGURE 16 - Calibration Setup for BY Transmitter

CALIBRATING THE TRANSMITTER

The Transmitter is shipped completely calibrated. If a calibration check is desired before placing the Transmitter in service, perform "Pre-Service Adjustment Check" below. Perform "Complete Calibration Procedure" for specific Transmitter (or desired accuracy) after replacing major components or changing range.

Use an accurate DC voltmeter for all calibration procedures - ±.10% accuracy for "Pre-Service Adjustment Check", ±.05% accuracy for "Complete Calibration". Test jacks and calibration adjustments are shown in Figure 17.

PRE-SERVICE ADJUSTMENT CHECK
(Refer to Figures 16 and 17)

1. Connect Transmitter in calibration setup as shown in Figure 16. Make certain vent valves V1 and V2, and internal equalizing valve V3 are closed. For all voltage measurements use a DC voltmeter accurate to ±.10%.

2. Loosen four screws and remove amplifier cover.

3. Connect voltage supply leadwires as shown in Figure 14 on page 15.

4. Apply 118v AC power. Allow one hour warmup time.

5. Connect voltmeter across test jacks J2 and J3.

6. Apply 50% input differential pressure.

7. Oscillator voltage should be 17.25 volts DC (±.1v). Adjust oscillator adjustment (R16) as necessary until voltage is correct.

8. Connect voltmeter across test jacks J1 and J2.

9. Output voltage should be 0 volts DC (±.25v). Adjust zero adjustment (R19) as necessary until voltage is correct.

10. Apply 0% input differential pressure. Output voltage should be -10 volts (±.25v). If voltage is incorrect, adjust range adjustment (R30) as necessary until voltage is correct.

11. Repeat steps 5 thru 10 until output voltages are correct. If unable to obtain correct voltages, perform applicable "Complete Calibration Procedure" below.

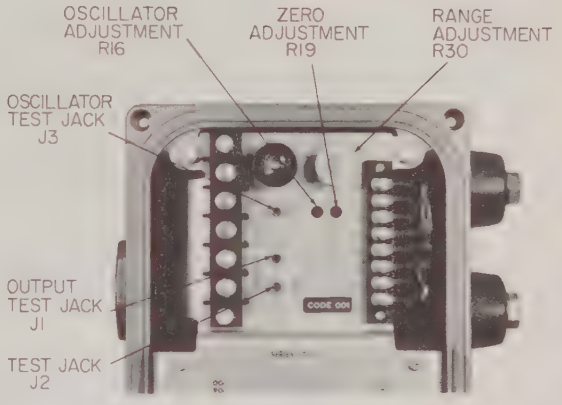


FIGURE 17 - Amplifier Adjustments

12. Place Transmitter in service.

13. With equalizing valve V3 open, check voltage across output test jacks J1 and J2 for possible zero shift.

14. Refer to Figure 13. Remove 5/16 Allen pipe plug (55) on bottom of Transmitter. Adjust coil advance screw (48) until output voltage is -10 volts DC (±.05v) if necessary.

15. Close equalizing valve V3.

COMPLETE CALIBRATION PROCEDURE FOR TYPE BY□□□0

Complete Calibration is necessary after the replacement or removal of capsule, LVDT, or amplifier, or after changing Transmitter range. For all voltage measurements use a DC voltmeter accurate to ±.05%. Refer to Figures 16 and 17.

1. Remove Transmitter from service.

2. Connect Transmitter in calibration setup as shown in Figure 16. Make certain vent valves V1 and V2, and internal equalizing valve V3 are closed.

3. Loosen screws and remove amplifier cover.

4. Turn zero adjustment (R19) to mid position. Turn oscillator adjustment (R16) full counterclockwise.

5. Apply 118v AC power. Allow one hour warmup.

6. Connect voltmeter across test jacks J2 and J3.

7. Apply 50% input differential pressure.

8. Adjust oscillator adjustment until output voltage is 17.25 volts DC (±.1v).

9. Connect DC voltmeter across output test jacks J1 and J2.

10. Refer to Figure 13. Remove 5/16 Allen pipe plug (55) on bottom of Transmitter. Adjust coil advance screw (48) until output voltage is 0 volts DC (±.10v).

11. Reconnect voltmeter across test jacks J2 and J3. Meter should read 17.25 volts DC (±.1v).

12. Connect voltmeter across test jacks J1 and J2.

13. Apply 0% input differential pressure to Transmitter.

14. Adjust range adjustment (R30) until output voltage is -10 volts DC (±.01v).

15. Apply 100% input differential pressure to Transmitter. Voltmeter should now read +10 volts DC (±.10v).

16. If output voltage is correct:

a. Place Transmitter in service.

b. With equalizing valve V3 open, check voltage across output test jacks J1 and J2 for possible zero shift.

c. Refer to Figure 13. Remove 5/16 Allen pipe plug (55) on bottom of Transmitter. Adjust coil advance screw (48) until output voltage is -10 volts DC (±.05v) if necessary.

d. Close equalizing valve V3.

17. If output voltage is <u>not</u> correct:

a. Adjust range adjustment to a value midway between voltage read in step 15 and +10 volts DC.

b. Repeat steps 12 thru 15. If correct voltages still cannot be obtained, refer to "Troubleshooting", page 12.

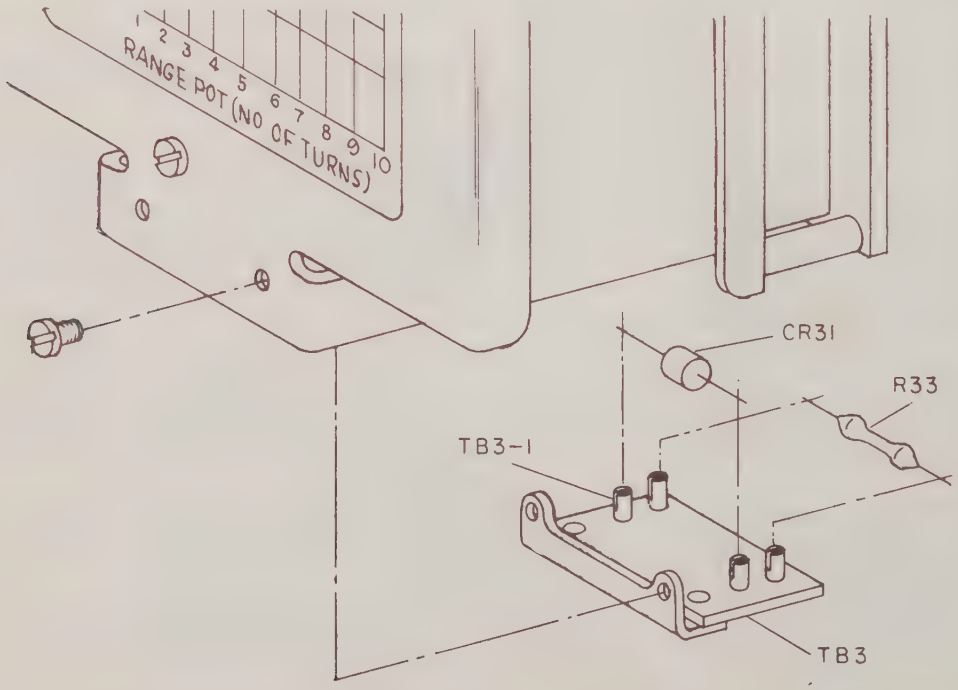


FIGURE 18 - Calibration Board, Resistor and Diode for Type BY□□□1

COMPLETE CALIBRATION PROCEDURE FOR TYPE BY□□□1

To obtain ±1/4% accuracy it will be necessary to linearize the amplifier. On some units, the "Complete Calibration Procedure for Type BY□□□0" is sufficient for this purpose. On other units it will be necessary to add a linearizing resistor (R33) to the amplifier to compensate for nonlinear capsule stroke. Added diode CR31 determines whether the direction of this compensation is positive or negative. For all voltage measurements use a DC voltmeter accurate to ±.05%. Refer to Figure 18.

1. Remove 2 screws and pull out calibration board TB3 as far as attached leads allow.

2. Unsolder resistor R33 from terminals.

3. Calibrate the Transmitter as outlined under "Complete Calibration Procedure for Type BY□□□0". Make all range adjustments accurate to ±.025 volts.

4. If desired accuracy cannot be obtained by above procedure, proceed to step 5.

5. Apply 100% input differential pressure.

a. If output voltage is greater than +10 volts, solder diode CR31 to calibration board, anode to TB3-1.

b. If output voltage is less than +10 volts, solder diode CR31 to calibration board, cathode to TB3-1.

6. Check voltage output at 0%, 50% and 100% pressure. Calculate the difference between the upper and lower voltage span (Span = voltage from middle value to upper/lower value).

7. Divide the difference between upper and lower voltage spans by total voltage span; then multiply by 100% to obtain % difference.

$$\frac{\Delta \text{Upper and Lower Span}}{\text{Total Span}} \times 100\% = \%\ \text{Difference}$$

8. Solder ±5% deposited carbon linearizing resistor R33 to calibration board terminals. See Table I for value.

9. Apply 50% input differential pressure. Adjust zero adjustment (R19) until output voltage is 0 volts (±.1v).

10. Apply 0% input differential pressure. Adjust range adjustment (R30) until output voltage is -10 volts (±.025v).

11. Apply 100% input differential pressure. Output voltage should be +10 volts DC (±.025v).

12. If output voltage is not correct, repeat steps 5-11. If correct voltages cannot be obtained, refer to "Troubleshooting", page 12.

13. If output voltage is correct:

a. Place Transmitter in service.

b. With equalizing valve V3 open, check voltage across output test jacks J1 and J2 for possible zero shift.

c. Refer to Figure 13. Remove 5/16 Allen pipe plug (55) on bottom of Transmitter. Adjust coil advance screw (48) until output voltage is -10 volts DC (±.025v) if necessary.

d. Close equalizing valve V3.

EXAMPLE:

a. Output at 100% pressure = +10080mv
Output at 50% pressure = + 21mv
Output at 0% pressure = - 9980mv

b. 10080mv is greater than +10v, therefore: anode of diode CR31 goes to TB3-1.

c. $\frac{10101 - 9959}{10080 + 9980} \times 100\% = .71\%$ Difference

d. According to Table I, resistor R33 = 33k-ohms.

% DIFFERENCE	R33
*.60 - 1.05	33K
1.10 - 1.50	22K
1.55 - 2.00	15K

*Note: for values below .60, no resistor is needed.

TABLE I

CHANGING THE RANGE OF THE TRANSMITTER

Possible ranges (Figure 25) are limited by the size of the capsule. If desired range exceeds capabilities of present capsule, replace capsule as outlined under "Replacing the Capsule Sensor". If capsule is capable of desired range, proceed as follows.

NOTE: If span and suppression of capsule are to be changed, omit step 9. If capsule suppression alone is to be changed, omit step 10. If span alone is to be changed, follow steps 15-20 only.

1. Remove amplifier assembly from amplifier housing as outlined under "Replacing the Amplifier", page 15.

2. Note position of shorting link mounted on back of amplifier chassis (Figure 19).

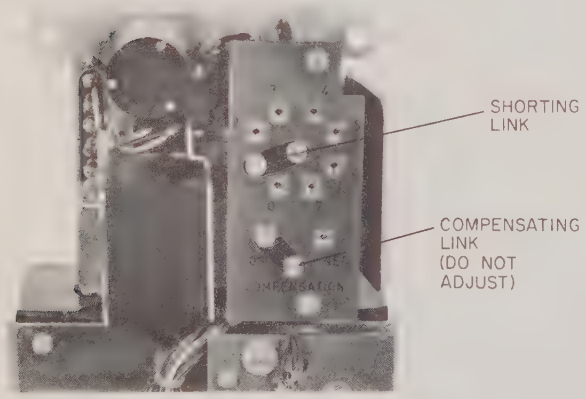


FIGURE 19 - Location of Shorting Link

3. Using the formula in Figure 21, calculate % Maximum Capsule Span for present and desired ranges. See example in Figure 21.

4. Refer to Graph 1. Plot Point A, corresponding to intersection of present % Maximum Capsule Span (as calculated in step 3) and present Shorting Link Position (noted in step 2).

5. From Point A, locate Point B on ordinate of graph. Point B represents Zero Output Shift in volts/100F.

6. Using the formula, calculate Midrange Value of present Transmitter pressure range. Locate this value on abscissa of Graph 2.

7. Plot Point C, which is the intersection of the Zero Output Shift value (Point B in Graph 1) and the Midrange Value calculated above.

8. Thru Point C, construct Line 1 parallel to line of present % Maximum Bellows Range.

9. If suppression alone is to be changed:

a. Calculate Midrange Value of desired Transmitter pressure range. Locate this value on abscissa of graph.

b. Locate Point E on Line 1, directly over desired Midrange Value on abscissa.

10. If span and suppression are to be changed:

a. Note Point D where Line 1 intersects abscissa of graph.

b. Thru Point D, construct Line 2 parallel to desired % Maximum Capsule Span (as calculated in step 3).

c. Calculate Midrange Value of desired Transmitter pressure range. Locate this value on abscissa of graph.

d. Locate Point E on Line 2 directly over desired Midrange Value on abscissa.

11. Locate Point F (across from Point E), which is Zero Output Shift of desired range.

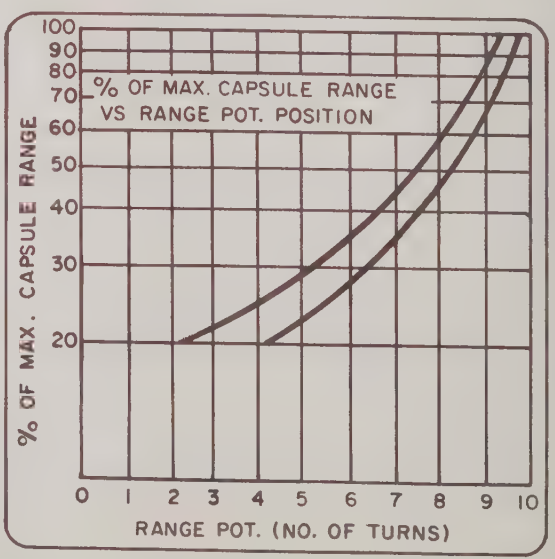


FIGURE 20 - Range Adjustment Turn Chart

12. Refer back to Graph 1. From Zero Output Shift value determine new Shorting Link Position.

13. Connect Shorting Link (Figure 19) on amplifier chassis in new position.

14. Replace amplifier assembly in amplifier housing. Reconnect LVDT leadwires according to color code in Figure 15.

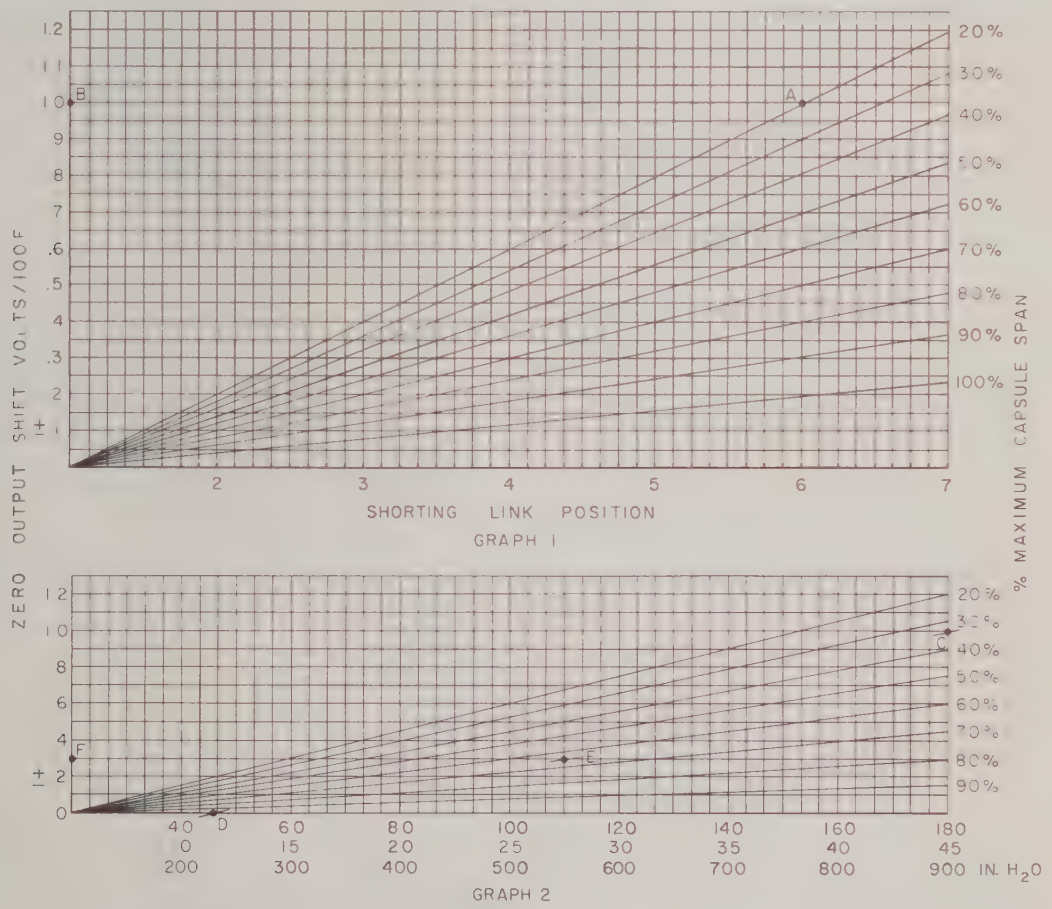
15. Turn range adjustment (R30) on amplifier chassis clockwise, the number of turns needed to attain new range (see Figure 20).

16. Connect voltmeter across output test jacks J1 and J2.

17. Refer to Figure 13. Remove 5/16 Allen pipe plug (55) on bottom of Transmitter. Adjust coil advance screw (48) until output voltage is -10 volts DC.

18. Replace pipe plug.

19. Transmitter may now be placed in service. If accuracy is not within limits, perform "Complete Calibration Procedure" for your specific transmitter.



$$\%\text{MAX. CAPSULE SPAN} = \frac{\text{RANGE SPAN OF TRANSMITTER}}{\text{MAX. CAPSULE SPAN}} \times 100\% \qquad \text{MIDRANGE VALUE} = \frac{\text{MIN. TRANSMITTER SPAN} + \text{MAX TRANSMITTER SPAN}}{2}$$

EXAMPLE:

PRESENT RANGE = 160"-200" H_2O

$\%\text{MAX. CAPSULE SPAN} = \frac{40}{200} \times 100\% = 20\%$

$\text{MIDRANGE VALUE} = \frac{160+200}{2} = 180$

ZERO OUTPUT SHIFT = +1.0v/100F (F/GRAPH 1)

SHORTING LINK POSITION = 6

DESIRED RANGE = 60"-160" H_2O

$\%\text{MAX. CAPSULE SPAN} = \frac{100}{200} \times 100\% = 50\%$

$\text{MIDRANGE VALUE} = \frac{60+160}{2} = 110$

ZERO OUTPUT SHIFT = +.3v/100F (F/GRAPH 2)

SHORTING LINK POSITION = 3

FIGURE 21 - Graphs and Examples for Changing Range

HOW THE TRANSMITTER OPERATES

The Type BY Process Computer Transmitter senses the difference between two pressures, and transmits a -10 to +10 volt DC output signal proportional to their difference. Measurable pressures range from 10 inches to 1000 inches of water.

The Type BY Transmitter (shown schematically in Figure 22) consists essentially of a welded bellows capsule connected to the core of a linear variable differential transformer (LVDT). The difference between process pressure within the capsule and process pressure outside the capsule causes the capsule to expand or contract, thus moving the attached core of the LVDT. This core provides the inductive coupling between the primary and secondary windings of the LVDT. Motion of the core induces a voltage change proportional to the differential pressure measured. This voltage is amplified and regulated by an amplifier assembly and appears as the output to the customer's receiving component.

Capsule protection is provided by filters at HI and LO pressure ports (Figure 22) and overpressure seals. Seals can withstand up to 6000 psi difference pressure. (NOTE: No overpressure protection is provided for gas measurement.)

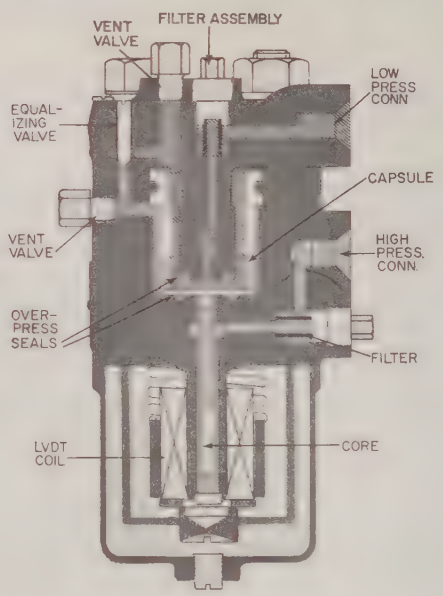


FIGURE 22 - Schematic View

CIRCUIT DESCRIPTION

Refer to Figures 23 and 24. In the amplifier, line AC voltage is rectified and filtered full wave. The oscillator circuit, consisting of transistors Q1, Q2 and toroid transformer T2, converts the pulsating DC into a 1000Hz square wave. The square wave output is filtered by choke L2 and capacitor C5 to yield a pure 1000Hz signal. This signal excites the coil of the linear variable differential transformer (LVDT).

There are two outputs from the LVDT. One is the output from two differentially connected secondaries. These are sensitive to changes in

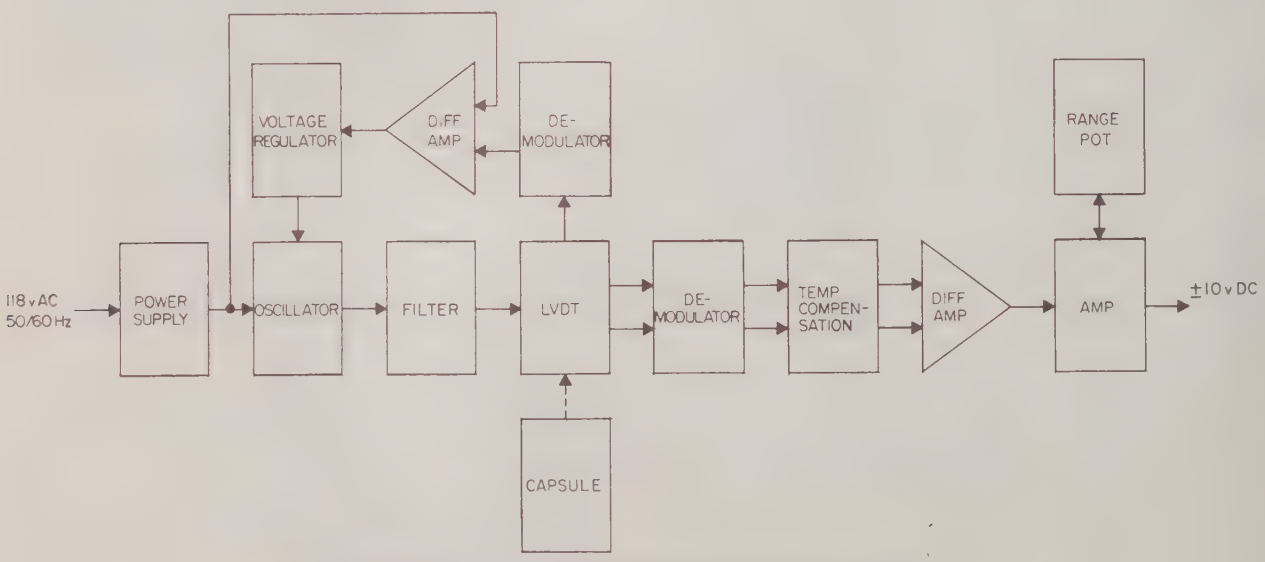
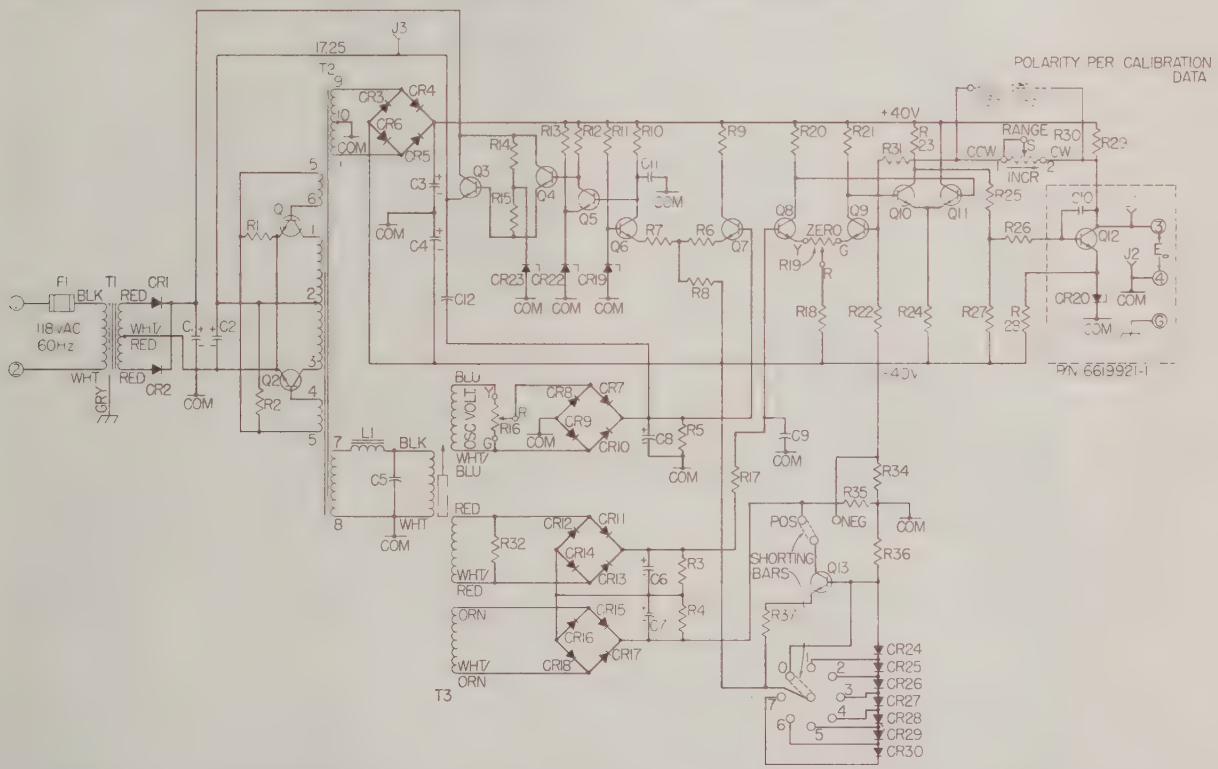


FIGURE 23 - Block Diagram of BY Transmitter

core position, as determined by movement of the pressure sensitive capsule. The second output is derived from a separate winding of the LVDT, which is not affected by the movable core. This winding, sensitive to variations in line voltage and ambient temperature change, is applied to transistor Q7, which forms one side of a differential amplifier. In the differential amplifier (Q6, Q7), a stable voltage controlled by Zener diode CR19 is compared with the feedback from the LVDT. Error voltage, due to variations in line voltage and ambient temperature change, is amplified by transistors Q4 and Q5. The signal is then applied to the base of transistor Q3 in the voltage regulator circuit. The output of Q3 corrects the voltage in the oscillator circuit for changes occurring in the LVDT.

The AC output signals from the core-sensitive differentially connected windings in the LVDT are demodulated and filtered by two full wave rectifiers (diodes CR11-CR14 and CR15-CR18). The resultant DC signals are then applied, thru a temperature compensating stage (Q13, CR24-CR30), to the bases of transistors Q8 and Q9 in the differential amplifier stage. The differential voltage is amplified by transistors Q10, Q11, and Q12 to yield an output level of ±10 volts DC. This is the differential pressure output to be read on customer's receiving component. Gain and linearity of the amplifier are controlled by resistors R31, R22 and range potentiometer R30. Test jacks and oscillator and zero-adjust potentiometers are also provided for calibration purposes.



COMPONENT	DESCRIPTION	COMPONENT	DESCRIPTION	COMPONENT	DESCRIPTION
C1, C3, C4	CAPACITOR 200 MFD 50V DC	R1	RESISTOR 390Ω 1/2W 5%	R25	RESISTOR 38.3K 1/2W 1%
C2	CAPACITOR 100 MFD 50V DC	R2	RESISTOR 5.6K 1/2W 5%	R26	RESISTOR 1K 1/2W 5%
C5, C11	CAPACITOR .1 MFD 200V DC	R3,R4,R8,R9,R10	RESISTOR 100K 1/2W 1%	R27	RESISTOR 24.9K 1/2W 1%
C6, C7	CAPACITOR .68 MFD 100V DC	R5	RESISTOR 60.4K 1/2W 1%	R28	RESISTOR 2.67K 1/2W 1%
C9	CAPACITOR 1.0 MFD 100V DC	R6, R7	RESISTOR 200Ω 1/2W 1%	R30	POTENTIOMETER 50K WW 10 TURN
C10	CAPACITOR .015 MFD 100V DC	R11	RESISTOR 8.66K 1/2W 1%	R31	RESISTOR 3.75K WW 3W 1%
C8	CAPACITOR 25 MFD 25V DC	R12	RESISTOR 5.11K 1/2W 1%	R32	RESISTOR PER CALIB. DATA
C12	CAPACITOR 10 MFD 50V DC	R13, R29	RESISTOR 10K 1/2W 1%	R33	RESISTOR PER CALIB. DATA
CR1 THRU CR18	DIODE 1N3193	R15	RESISTOR 9.09K 1/2W 1%	L1	CHOKE .2 HENRY
CR24 THRU CR31		R14, R17	RESISTOR 2K 1/2W 1%	T1	POWER TRANSFORMER
CR19	ZENER DIODE 1N752A 5.6V	R16	POTENTIOMETER 5K WW ±10%	T2	TOROID TRANSFORMER
CR20	ZENER DIODE 1N965B 15V	R18	RESISTOR 200K 1/2W 1%	T3	LVDT
CR22	ZENER DIODE 1N962B 11V	R19	POTENTIOMETER 2K WW ±10%	F1	FUSE 1 AMP
CR23	ZENER DIODE 1N969B 22V	R20, R21	RESISTOR 249K 1/2W 1%	J1, J2, J3	TEST JACK
Q1, Q2, Q4, Q12	TRANSISTOR 2N2270	R22	RESISTOR 2K WW 3W 1%	R34, R35	RESISTOR 60.4Ω 1/2W 1%
Q5 THRU Q11, Q13	TRANSISTOR TN103	R23	RESISTOR 6.04K 1/2W 1%	R36	RESISTOR 7.15K 1/2W 1%
Q3	TRANSISTOR 2N3054	R24	RESISTOR 12.1K 1/2W 1%	R37	RESISTOR 681Ω 1/2W 1%

FIGURE 24 - Schematic Circuit Diagram for BY Transmitter

TABLE II - TRANSMITTER SPECIFICATIONS

OPERATING CONDITIONS:

INFLUENCE	NOMINAL REFERENCE	NORMAL	OPERATIVE LIMITS
AMBIENT TEMPERATURE	75F	-20F TO +160F	-20F TO +160F
SUPPLY VOLTAGE	118v AC	107-127v AC	100-135v AC
FREQUENCY	50/60Hz	48-62Hz	45-75Hz

AMBIENT TEMPERATURE EFFECT . . . . . ±0.01% RANGE SPAN/°F

SUPPLY VOLTAGE EFFECT . . . . . ±0.005% RANGE SPAN/VOLT

SUPPLY FREQUENCY EFFECT . . . . . ±0.025% RANGE SPAN/Hz

STATIC PRESSURE EFFECT . . . . . ERROR LINEAR WITH PRESSURE. MAX. ERROR = 0.5% AT 6000 PSI.

REFERENCE PERFORMANCE CHARACTERISTICS (% RANGE SPAN)

ACCURACY . . . . . ±0.50% TYPE BY□□□0, ±0.25% TYPE BY□□□1

DRIFT . . . . . 0.15% (3 MONTH PERIOD)

HYSTERESIS 0.05%

INDEPENDENT LINEARITY . . . . . ±0.20%

OUTPUT RIPPLE (PEAK TO PEAK) 0.10%

REPEATABILITY 0.05%

RESOLUTION . . . . . INFINITE

TILT . . . . . 0.4%/60° TILT (TYPE BY□23□), 2%/60° TILT (TYPE BY□22□)

VIBRATION (PER MIL-STD-167) . . . . . ±0.35%

FREQUENCY RESPONSE . . . . . 75Hz CORNER FREQUENCY

DESIGN DATA

MIN. LOAD RESISTANCE FOR LESS THAN 0.1% OUTPUT CHANGE . . . . . 10K OHMS

POWER CONSUMPTION 8.5va

POWER FACTOR . . . . . 0.7 (LAGGING)

ENCLOSURE CLASSIFICATION . . . . . NEMA 4-WATERTIGHT

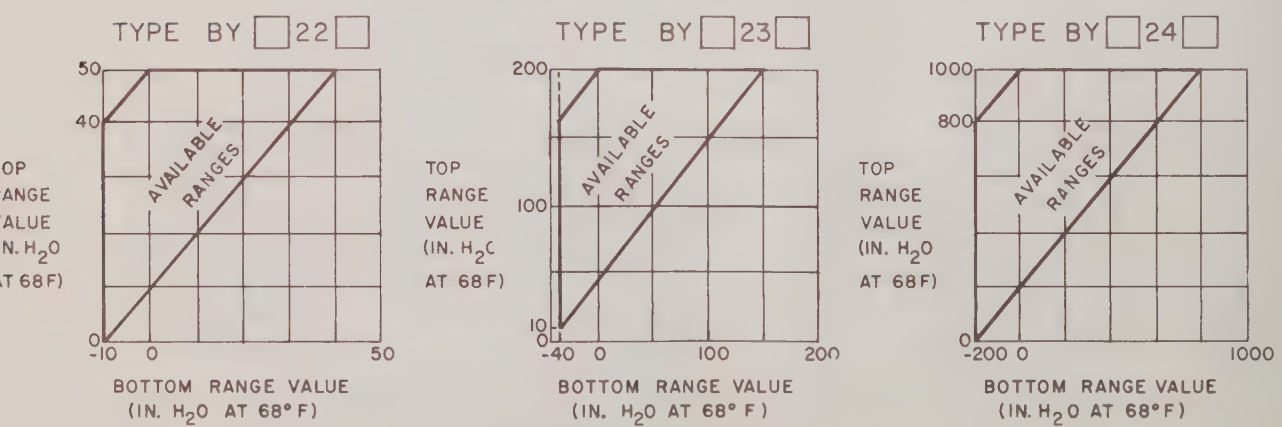
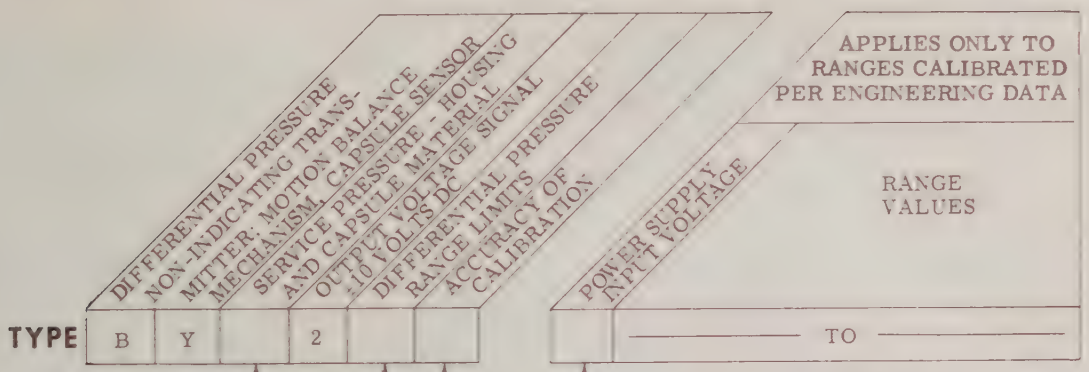


FIGURE 25 - Transmitter Range Charts

EXPLANATION OF NOMENCLATURE



A	118v	60Hz
B	118v	50Hz

0	1/2% OF RANGE SPAN	BY CUSTOMER PER ENGINEERING DATA
1	1/4% OF RANGE SPAN	PER ENGINEERING DATA ONLY

	SERVICE PRESSURE (PSIG)	HOUSING MATERIAL	CAPSULE MATERIAL
1	6000	CARBON STEEL	AM350 STAINLESS
2	6000	#316 STAINLESS	INCONEL 718
3	6000	#316 STAINLESS	AM350 STAINLESS
4	6000	CARBON STEEL	INCONEL 718
6	1500	CARBON STEEL	AM350 STAINLESS
7	1500	#316 STAINLESS	INCONEL 718
8	1500	#316 STAINLESS	AM350 STAINLESS
9	1500	CARBON STEEL	INCONEL 718

	MINIMUM RANGE (IN. H_2O)	MAXIMUM RANGE (IN. H_2O)
2	0-10	0-50
3	0-50	0-200
4	0-200	0-1000

An "X" in any Nomenclature position indicates that the variation is special. An "X" as a suffix to either Type or Model indicates that the Transmitter includes some special feature not covered by the standard Nomenclature.

REPLACEMENT PARTS

SPARE PARTS KITS

The Spare Parts Kits tabulated on Parts Drawings (Figures 26 and 27) should be carried in stock. Specify the Spare Parts Kit part number to order a complete kit. Refer also to "Ordering Individual Parts" below.

ORDERING INDIVIDUAL PARTS

Parts Drawings covering the Type BY Process Computer Transmitter are shown in Figures 26 and 27. These drawings will normally apply to the units furnished. However, there may be individual differences in specific assemblies due to:

a. Design changes made since the printing of this instruction section.

b. Special design of equipment furnished to make it suitable for special application.

Therefore, when ordering individual parts, assure the receipt of correct replacements by specifying on the order:

1. Complete nomenclature, series number, part number, code label number and serial number (if any) of equipment for which parts are desired.

2. Parts Drawing Number on which each part is illustrated.

ITEM	PART NO.	NAME
1		CODE LABEL SPECIFY NUMBER WHEN ORDERING PARTS
2	6620543-1	AMPLIFIER COVER ASSY
3	10-32x5/8	PAN HD PHILLIPS SST SCREW, 4 REQD
4	197242-3	RETAINING RING, 4 REQD
5	4-40x1/4	PAN HEAD CD PL SEMS EXT, 2 REQD
6	10-32x5/16	PAN HD CD PL SEMS EXT, 4 REQD
7	6619921-1	AMPLIFIER ASSY
8	6614522-1H	SEALING CORD, 27"
9	1/4-20x5/8	HEX HD CD PL CAP SCR, 3 REQD
10	1/4	CD PL MED SPR LKWASH, 3 REQD
11	6620609-1	TERMINAL BOARD ASSY
12	1942051-□*	RESISTOR } BY□□□1
13	1942333-1	DIODE } ONLY
14	6619891-1	AMPLIFIER HOUSING
15	6619973-1	SEAL BUSHING
16	SEE TABLE	SEAL
17	SEE TABLE	HOUSING COVER
18	6620811-1	TRAVEL STOP
19	10-32x1/4	PAN HD SST SEMS EXT
20	SEE TABLE	O-RING
21	6620555-2	BACKUP RING
22	6620810-1	EQUALIZING VALVE PLUG
23	682389-1	VENT VALVE ASSY, 2 REQD
24	SEE TABLE	SQUARE CUT SEALING RING, 2 REQD
25	SEE TABLE	O-RING, 2 REQD
26	6620555-1	BACKUP RING, 2 REQD
27	6619968-1	FILTER ASSY, 2 REQD
28	197444-1	SPRING LKWASH, 4 REQD
29	197443-6	5/8-11 HIGH STRENGTH NUT, 4 REQD
30	1951335-228	SEALING RING
31	1962399-1	NAMEPLATE
32	2-3/16	RD HD SST THD FRMG SCREW, TYPE U, 2 REQD
33	SEE TABLE	CAPSULE HOUSING
34	SEE TABLE	O-RING
35	6619967-1	STUD, 4 REQD
36	6619678-3	SEAL (BY2, 3, 7, 8)
	6619678-1	SEAL (BY1, 4, 6, 9)
37	6619679-1	SEAL BUSHING
38	SEE TABLE	CORE ROD ASSY
39	197463-2	NO. 3-48 SST NUT
40	SEE TABLE	CAPSULE ASSY
41	SEE TABLE	O-RING
42	SEE TABLE	O-RING
43	6619971-1	WAVY WASHER
44	1/4-20x3/4	HEX SOC HD SST CAP SCREW, 4 REQD
45	1/4	SST MED SPR LKWASH, 4 REQD
46	6619892-1	LVDT COVER ASSY
47	1951360-2	RETAINING RING, 4 REQD
48	6619977-1	COIL ADV SCREW
49	6621396-1	NEEDLE THRUST BRG RACE, 2 REQD
50	6621395-1	NEEDLE THRUST BRG
51	6619976-1	COIL RETAINING PLATE
52	6619896-1	LVDT COIL ASSY
53	6620262-1	SPACER
54	6619965-1	COIL RETAINING SPRING
55	6619966-1	PIPE PLUG
56	10-32x1/2	HEX SOC HD CD PL CAP SCREW, 2 REQD
57	6619975-1	COIL STUD, 2 REQD

* PER ENGINEERING DATA

TABLE

TYPE	SPARE PARTS KIT PT. NO.	ITEM 16	ITEM 17	ITEM 20	ITEM 24	ITEM 25	ITEM 33	ITEM 34	ITEM 38	ITEM 41	ITEM 42
BY2, BY3 BY7, BY8	250024-2	6619678-4	6619963-2	1951359-1	6619972-2	1951359-3	6619984-2	1951359-2	6619978-2	1951359-4	1951359-5
BY1, BY4 BY6, BY9	250024-1	6619678-2	6619963-1	5311428-10	6619972-1	5311428-11	6619984-1	315422-1	6619978-1	5311428-24	315422-18

SPARE PARTS KITS	
PT. NO.	KIT CONTAINS:
250024-1 AND 250024-2	1 EACH ITEMS 5, 33, 34, 35, 37, 38, 39, 40 2 EACH ITEMS 19, 42 1 EACH FUSE (ITEM 4 ON PARTS DWG. E21-20)

Parts List for Figure 26

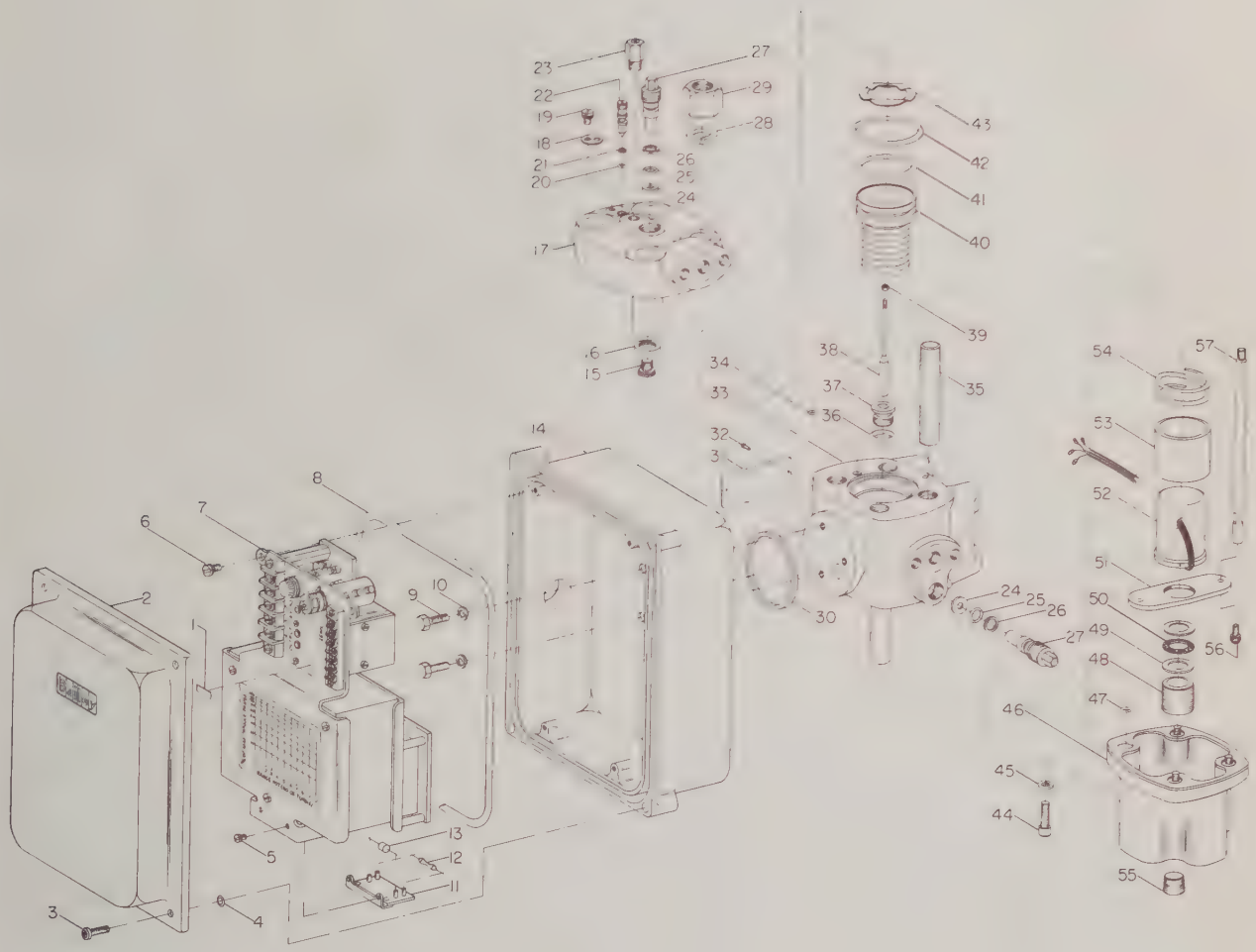
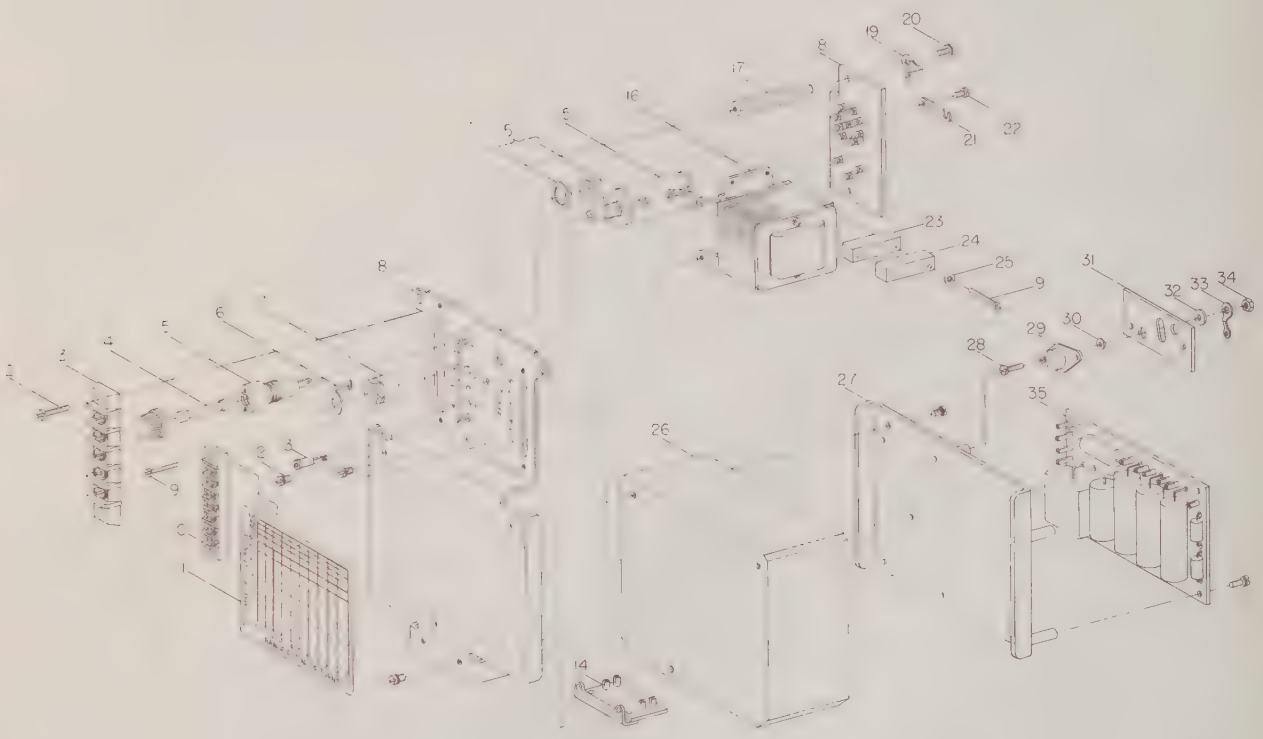


FIGURE 26 - Parts Drawing E21-19, Type BY Process Computer Transmitter



ITEM	PART NO.	NAME
1		CODE LABEL SPECIFY NUMBER WHEN ORDERING PARTS
2	6-32x5/8	PAN HD CD PL SEMS EXT, 2 REQD
3	1942813-5	TERMINAL BLOCK
4	194776-11001	FUSE*
5	1941504-1	FUSE EXTRACTOR POST
6	6620953-1	POINTER
7	1942329-3	SHAFT LOCK
8	6619916-1	CHASSIS
9	2-56x3/4	PAN HD CD PL MACH SCR, 4 REQD
10	194464-8	TERMINAL BLOCK
11	6620952-1	CALIBRATION DECAL
12	4-40x1/4	PAN HD CD PL SEMS EXT, 16 REQD
13	1942826-1	TEST JACK, 3 REQD
14	6620609-1	TERMINAL BD ASSY
15	1944525-1	POTENTIOMETER
16	6619912-1	POWER TRANS ASSY
17	6621385-1	TAPPED SPACER, 2 REQD
18	6621383-1	COMPEN BD ASSY
19	69316-2	GROUND LUG
20	6-32x3/8	PAN HD CD PL SEMS EXT, 2 REQD
21	6621384-1	JUMPER, 2 REQD
22	4-40x3/16	PAN HD MACH SCR, 4 REQD
23	1942530-1	TRIMMER POT
24	1942530-3	TRIMMER POT
25	1204-00	SHKPF LOCKWASHER, 2 REQD
26	6619841-1	ENCAPSULATED AMPL (6619921-1 ONLY)
26	6619841-2	ENCAPSULATED AMPL (6619921-2 ONLY)
27	6619915-1	MTG PLATE ASSY
28	4-40x7/16	PAN HD CD PL MACH SCR, 2 REQD
29	1944357-1	TRANSISTOR NPN
30		MICA INS, 2 REQD
31	6619913-1	HEAT SINK
32		INS WASHER, 2 REQD
33	69316-3	GROUND LUG
34	4-40	CD PL HEX NUT, 2 REQD
35	6619840-1	POWER SUPPLY ASSY

*ITEM INCLUDED IN SPARE PARTS KIT TABULATED ON PARTS DRAWING E21-19

FIGURE 27 - Parts Drawing E21-20, Amplifier Assembly, Pt. No. 6619921-1

Product Warranty

Bailey Meter Company warrants the products manufactured by it to be free from defects in material and workmanship and will repair or replace, at its option, free of charge, f.o.b. its factory, such part or parts which prove defective within one year from date of shipment. In respect to any products which are not an integral part of a product manufactured by the Company, the warranty given by the manufacturer thereof shall apply.

Shipping Damage

We strongly recommend that you inspect and test your instrument as soon as you receive it. If the instrument is damaged or operates improperly, notify the carrier for inspection of the shipment. The carrier's claim agent will prepare a report of damage, a copy of which should be forwarded to your nearest Bailey District Office (see back cover for location). The District Office will then tell you how to have the instrument repaired or replaced.

Service

The Bailey Meter Company is vitally concerned that your Bailey instrument provides continued, fine performance. This instruction manual is designed to fully describe the correct installation, operation, and maintenance of your instrument under recommended conditions. If the need arises, factory-trained Service Engineers are on call for prompt, in-plant maintenance. Telephone or wire your nearby Bailey District Office to make arrangements for this service (see back cover for location and telephone number).

Replacement Parts and Supplies

Complete parts drawings and recommended spare parts kit information are included in this instruction manual. When replacement parts or supplies are required for maintenance of your Bailey instrument, contact your nearest Bailey District Office (see back cover for location). Always specify complete data on the instrument nameplate on your inquiry or order for parts. Common parts are available for shipment within 48 hours on a speed-order basis.

BAILEY METER COMPANY DISTRICT OFFICES, U.S.A.

CALIFORNIA

San Francisco
Code 415 Phone 989-6140

Los Angeles
Code 213 Phone 283-1187

COLORADO

Denver
Code 303 Phone 757-5408

GEORGIA

Atlanta
Code 404 Phone 378-4348

ILLINOIS

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LOUISIANA

New Orleans
Code 504 Phone 488-0841

MASSACHUSSETS

Boston
Code 617 Phone 426-0465

MICHIGAN

Detroit
Code 313 Phone 357-0440

MINNESOTA

St. Paul
Code 612 Phone 645-7752

MISSOURI

Kansas City
Code 816 Phone 361-4902

St. Louis
Code 314 Phone 962-5532

NEW YORK

Buffalo
Code 716 Phone 839-3662

New York
Code 212 Phone 986-8770

Schenectady
Code 518 Phone 374-7991

NEW JERSEY

East Orange
Code 201 Phone 674-6830

NORTH CAROLINA

Charlotte
Code 704 Phone 334-9161

OHIO

Cincinnati
Code 513 Phone 281-0132

Cleveland
Code 216 Phone 851-8600

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Philadelphia
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TEXAS

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